Fort Future

The Virtual Installation

Force Projection Modeling

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of Engineers**

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Engineer Research and Development Center

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What's the Problem?

- No automated tools for "End to End" Mobilization and Deployment planning, rehearsal, and execution

- Mobilization and Deployments are inherently complex and resist improvement
  - "Fighting the last war"
  - "What did I fix? What did I break?"
  - "Can I get there from here?"
  - "What if your improvement slows down the deployment?"
- Currently available GIS data not exploited

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Deployment Planning Execution

- Current: Institutional Knowledge of what worked in the past

  "Great people making a less than optimal solution work"

- Future: Solution thru modeling and simulation
  - Capture expert knowledge in deployment models
  - Build plan and test virtually
  - Rehearse and refine thru simulation
  - Monitor execution and predict potential obstacles

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Interdependent Models

Mission
"What must be done?"

Process
How much time does it take?
"Who does it?"
"Where does it happen?
"What resources are needed?"
What constraints are there?

Infrastructure
"What must the facility do?"
"Can it do it?"
"What will improve it?"

Interdependent Deployment Models

Mission
"Deploy Troops"

Infrastructure
"Company Area"
"Motorpool"
"Marshalling Area"
"Airfield"

Process
"Alert and Recall"
"Vehicle Prep"
"Alert Holding Area"
"Call Forward Area"
"Ready Line"
"Load Vehicles and Passengers"
"Wheels Up"

Interdependent Deployment Model

```xml
- <ProcessTask name="HDRS-1-Other1" pctMeetsRqmt="0" EntityClass="Vehicle" role="Other1" priority="2">
  - <ProcessSubTask name="PrepLoad" pctMeetsRqmt="0">
      <Time interval="60" units="minutes" />
      <resource type="PrepTeam1" quantity="1" />
    </ProcessSubTask>
  </ProcessTask>
- <ProcessTask name="HDRS-2-Other1" pctMeetsRqmt="0" EntityClass="Vehicle" role="Other1" priority="3">
  - <ProcessSubTask name="Rigging" pctMeetsRqmt="0">
      <Time interval="100" units="minutes" />
      <resource type="RigTeam1" quantity="1" />
    </ProcessSubTask>
  </ProcessTask>
- <ProcessTask name="HDRS-3-Other1" pctMeetsRqmt="0" EntityClass="Vehicle" role="Other1" priority="4">
  - <ProcessSubTask name="JointInspection" pctMeetsRqmt="0">
      <Time interval="25" units="minutes" />
      <resource type="AFInspectHDRS" quantity="1" />
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  </ProcessTask>
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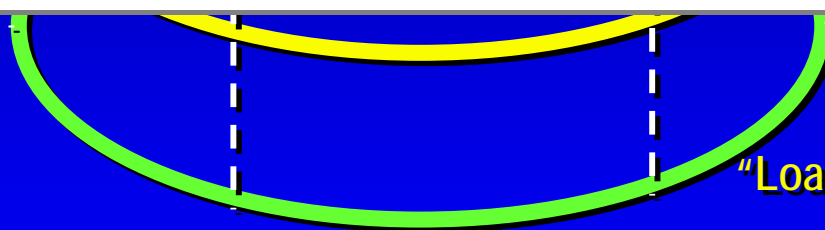
"Company Area"
"Motorpool"
"Marshalling Area"
"Airfield"

"Call Forward Area"
"Ready Line"
"Load Vehicles and Passengers"
"Wheels Up"

Interdependent Deployment Models

Mission
"Deploy Troops"

Infrastructure
"Company Area"
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"Call Forward Area"
"Ready Line"
"Load Vehicles and Passengers"
"Wheels Up"

Entity Model: Personnel

V3p_personnel_joined.txt - Notepad

File   Edit   Format   View   Help

```
ID      bld_ty_rh_ftr_cd        per_id  pay_grd_cd      ait_loc_cd      scrty_clsn_cd   V3p_person_us_armd_svc_cd       bld_ty_grp_cd   fa
id      person_company_cd       person_platoon_id       person_separation_date  assign_flag     logical_delete_flag     blood_type_cd   as
5565        MCGUIRK5565         E5          Y       A       A+      NO      M               M       BG              R
5566        STEWART5566         O3          F       A       A+      OO      M               M       BG              V
5567        COTE5567            E5                  A       A+      NO      M               M       BG              R
5568        HOLMES5568          E4                  A               NO      M               S       BG              R
5569        OGBORN5569          O2          F       A               CR      M               S       BG              R
5570        MARTIN5570          E5          F       A       A+      NO      M               M       BG              R
5571        BARTON5571          O3                  A               CR      M               M       BG              R
5572        SATTERLUND5572      O2          F       A               OE      F               M       AM              R
5573        HAMILTON5573        E4                  A               CR      M               M       AJ              R
5627        TUCKER5627          E4                  A       A+      PJ      M               M       BG              R
5628        LINTON5628          E6          Y       A       A-      CR      M               M       BG              R
5629        GREENLEE5629        O3          F       A               CR      M               S       BG              R
5630        PERKINS5630         E6          Y       A       O+      NO      M               M       BH              R
5631        GAULDIN5631         E2                  A               BB      M               S       BH              R
5632        LYONS5632           E4          Y       A       O+      GX      F               S       BG              R
5633        DUNBAR5633          E5          F       A               BB      M               M       BH              R
5634        STRICKLAND5634      E4                  A               NC      F               S       BG              R
5574        JENKINS5574         E4                  A       O-      BB      F               S       BG              R
5575        WILLIAMS5575        E6          Y       A       A+      BC      M               M       BG              R
5576        MILHOUSE5576        E4          F       A       A-      NO      M               S       BG              R
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5578        ANDERSON5578        E4                  A       A+      BB      F               S       BG              R
5579        MCLEAN5579          E5          F       A               NO      M               S       BG              R
5580        NAVARIJONAVARIJO5580        E5          A       O+      CR      M       M               AN                  R
5581        DAPRIX5581          E4          F       A               CR      M               M       BG              R
5582        KIM5582 E3                      A               GC      M               S       AG              R
5583        PAULO5583           E4          Y       A               NO      M               S       BG              R
5584        WALKER5584          E4                  A               NO      F               M       BG              R
5585        ALFORD5585          E5          Y       A       A+      CR      F               S       BH              R
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5589        THOMPSON5589        O5          A       A               CR      M               M       BG              R
5590        HUFFINE5590         E5          F       A       A+      NC      M               M       BG              R
5591        GOODMAN5591         E4                  A               BA      M               S       BH              R
5592        DEMPSEY5592         E4          F       A       A+      NC      M               M       BG              R
5593        KWON5593            E4                  A               MU      F               M       AG              R
5594        CORREA5594          E4                  A               NO      M               M       AL              R
5595    +   WYSE5595            E2          P       A       AB      NO      M               S       BG              R
5596        DEOLIVEIRA5596      E4          Y       A               CR      M               D       AL              R
5597        WELLINGTON5597      E4                  A               NO      M               S       BG              R
5598        HOLLOWAY5598        E6          F       A               BB      M               M       BG              R
5599        CORCORAN5599        E3                  A               NO      M               S       BG              R
5600        SPIVEY5600          E5          A       A       A+      BB      F               M       BG              R
5601        GUERIN5601          E5          Y       A               NO      M               M       BG              R
5602        GANT5602            E3                  A               XX      F               S       AR              R
5603        LINDSAY5603         E3                  A               NC      M               S       BG              R
5604        MORTON5604          E4          F       A       A+      NC      M               S       BG              R
5605        JEZIOR5605          O3          F       A               CR      M               S       BG              R
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5607        KLAUSER5607         E4                  A               NC      F               S       BG              R
5608        KLAUSER5608         E4                  A       A+      NC      F               S       BG              R
5609        GUTIERREZDEPINERESLA5609        E3          A       P       A               CR      M               M       AN              R
5610        JACKSON5610         E4                  A               CR      F               M       BG              R
5611        VARGASAGUILAR5611           E4          P       A               CR      M       S               AO                  R
5612        HANNAH5612          E4                  A               NC      F               S       BG              R
5613        SMITH5613           E4                  A               CR      M               S       BH              R
5614        MATSON5614          O4          F       A               TN      M               S       BG              R
5615        URDAZ5615           E3          P       A               CR      M               S       AL              R
5616        BALTZ5616           O3          F       A               NO      M               M       BG              V
5617        PARKER5617          E5          F       A               NO      M               M       BG              R
```

Entity Model: Vehicles


```
V3p_unit_equipment_item-AB1CB0_39.txt - Notepad
File  Edit  Format  View  Help
  dep_echelon      inc_id  suffix_id       uei_remarks       next_inspection_dt    tracked_veh_cd  uei_trnpn_ast_cd
d_rcd_ty_cd        uei_beam_assy_cqy       ctrld_invntry_item_cd   hazitm_id     uei_rec_1st_chng       pallet_id
                   D0001                   TRUCK WRECKER 8X8                                  4
   D0005                           TRK CARGO: MTV W/EQUIP                         4                186      A
   D0007                           TRK CARGO: MTV W/EQUIP                         4                186      A
   D0008                           TRK CARGO: MTV W/EQUIP                         4                186      A
   D0009                           TRK CARGO: MTV W/EQUIP                         4                186      A
   D0014                           TRK CGO MTV W/EQP                              4                186      A
   D0015                           TRK CGO MTV W/EQP                              4                186      A
   D0016                           TRK CGO MTV W/EQP                              4                186      A
   D0017                           TRK CGO MTV W/EQP                              4                186      A
   D0035                           TRK UTIL, HVY HMMWV                            3                115      A
   D0041                           TRK UTIL, HVY HMMWV                            3                115      A
   D0042                           TRK UTIL, HVY HMMWV                            3                115      A
   D0043                           TRK UTIL, HVY HMMWV                            3                115      A
   D0044                           TRK UTIL, HVY HMMWV                            3                115      A
   D0045                           TRK UTIL, HVY HMMWV                            3                115      A
   D0048                           TRK UTIL, HVY HMMWV                            3                118      A
   D0052                           TRK UTIL CRG/TRP CARR                          3                110      A
   D0054                           TRK UTIL CRG/TRP CARR                          3                110      A
   D0056                           TRK UTIL CRG/TRP CARR                          3                110      A
   D0058                           TRK UTIL CRG/TRP CARR                          3                110      A
   D0060                           TRK UTIL, HVY HMMWV                            3                115      A
   D0061                           TRK UTIL CRG/TRP CARR                          3                110      A
   D0094                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0095                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0096                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0097                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0098                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0100                           TRUCK CARGO TAC 8X8 W/LHS                      4                268      A
   D0101                           TRUCK WRECKER 8X8                              4                285      A
   D0102                           TRUCK WRECKER 8X8                              4                285      A
   D0103                           TRUCK WRECKER 8X8                              4                285      A
   D0104                           TRUCK WRECKER 8X8                              4                285      A
   D0105                           TRUCK WRECKER 8X8                              4                285      A
   D0106                           TRUCK WRECKER 8X8                              4                285      A
   D0129                           TRK UTIL EXPANDED CAP                          3                136      A
   D0130                           TRK UTIL EXPANDED CAP                          3                136      A
   D0131                           TRK UTIL EXPANDED CAP                          3                136      A
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   D0133                           TRK UTIL EXPANDED CAP                          3                136      A
```

Entity Model: Groups

```
<ProcessGroupTask name="ReadyLine-Serial 1 Arrival" pctMeetsRqmt="0" EntityClass="Vehicle" field="Serial_ID" field_entry="1" priority="70" />
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<ProcessGroupTask name="ReadyLine-Assemble Chalk 2" pctMeetsRqmt="0" EntityClass="Vehicle" field="Chalk_ID" field_entry="2" priority="81" />
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<ProcessGroupTask name="ReadyLine-Assemble Chalk 5" pctMeetsRqmt="0" EntityClass="Vehicle" field="Chalk_ID" field_entry="5" priority="84" />
<ProcessGroupTask name="ReadyLine-Assemble Chalk 6" pctMeetsRqmt="0" EntityClass="Vehicle" field="Chalk_ID" field_entry="6" priority="85" />
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<ProcessGroupTask name="ReadyLine-Assemble Chalk 8" pctMeetsRqmt="0" EntityClass="Vehicle" field="Chalk_ID" field_entry="8" priority="87" />
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<ProcessGroupTask name="ReadyLine-Assemble Chalk 13" pctMeetsRqmt="0" EntityClass="Vehicle" field="Chalk_ID" field_entry="13" priority="92" />
```

Resource Model:
Personnel, Equipment, and Vehicles

```
- <ResourceList>
<availResource class="Person" field="type" field_entry="Telephone" number="15" />
<availResource class="Person" field="type" field_entry="Dentist" number="9" />
<availResource class="Person" field="type" field_entry="Dental Staff" number="12" />
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<availResource class="Person" field="type" field_entry="Legal Staff" number="12" />
<availResource class="Person" field="type" field_entry="Doctor" number="15" />
<availResource class="Person" field="type" field_entry="Medical Staff" number="12" />
<availResource class="Person" field="type" field_entry="Nurse" number="18" />
<availResource class="Person" field="type" field_entry="CFA JI Team" number="5" />
<availResource class="Equipment" field="type" field_entry="Runway" number="1" />
<availResource class="Person" field="type" field_entry="Chalkmaster" number="2" />
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Resource Model:
Infrastructure

```
<Building id="D3555" process="Alert and Recall" />
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<Building id="A5474" process="SRP-Arrival" />
<Building id="A5474" process="SRP-Dental" />
<Building id="A5474" process="SRP-Legal-1-Family Care Plan" />
<Building id="A5474" process="SRP-Legal-2-Will and POA" />
<Building id="A5474" process="SRP-Medical-1-Glasses and Inserts" />
<Building id="A5474" process="SRP-Medical-2-Shots" />
<Building id="A5474" process="SRP-Admin-1-Verify ID Tags and ID" />
<Building id="A5474" process="SRP-Admin-2-DD93 and 56LV" />
<Building id="A5474" process="SRP Group Departure" />
<Building id="C8727" process="Motorpool Operations-Driver and TC Arrival" />
<Building id="C8727" process="Motorpool-Vehicle Prep Brief" />
<Building id="W1544" process="PHA Arrival-NOT Drivers and TCs" />
<Building id="C8727" process="Motorpool Operations-PMCS 1" />
<Building id="C8727" process="Motorpool Operations-Load 1" />
<Building id="C8727" process="Motorpool Operations-Serial 1" />
<Building id="C8727" process="Motorpool-Serial 1 Assembly" />
<Building id="A6813" process="AHA-Serial 1 Arrival" />
<Building id="C8727" process="Motorpool-Serial 2 Assembly" />
<Building id="A6813" process="AHA Operations-QC Equipment" />
<Building id="A6813" process="AHA Operations-Weigh Loads" />
```

The Virtual Sandbox

- A "Resource Contention Process Simulation"
- Assigns processes and resources dynamically to user assigned locations
- Entities for projection are created from a TC AIMS-like file
- Each entity is a discrete object with real-world attributes
- Entities are established for personnel, vehicles and equipment
- Entity "to-do" list determined by attributes
- Entities may be group into units, chalks, etc

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Address http://localhost:8080/ff/study/scope/edit.do?studyId=f2e530d3-bd66-11d8-a8e5-c7fc19075e8c Go

FORT FUTURE

Study: Scope
Study Name: Fort Bragg Deployment

MyFF Admin Account Logout Help

home > study > scope

You're logged in as **Fort Future Administrator** [change].

Overview → Scope → Alternatives → Simulation → Analysis → Outcome → Reports

Study Editor

Mission Analysis

- Scope
- Goals
- Datasets
- Events

Edit Study Scope

Define the study scope by selecting the problems that are relevant.

📁 Power Projection
  ☑ Deployment Mission
📁 Regional Sustainability
📁 Facility Acquisition
📁 Installation Security

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Local intranet

Run Simulation

Comparison

90-120 Minute Time Savings From Optimizing "Input" To Only One Deployment Process, The SRP

COA Comparison:

- **Inputs**
- **Resources**
- **Processes**
- **Facilities**

Left panel charts: Personnel Loading Aircraft 8, 9, 10, 11, 12, 13 — Time axis 08:00 through 04:00

Right panel charts: Personnel Loading Aircraft 8, 9, 10, 11, 12, 13 — Time axis 08:00 through 04:00
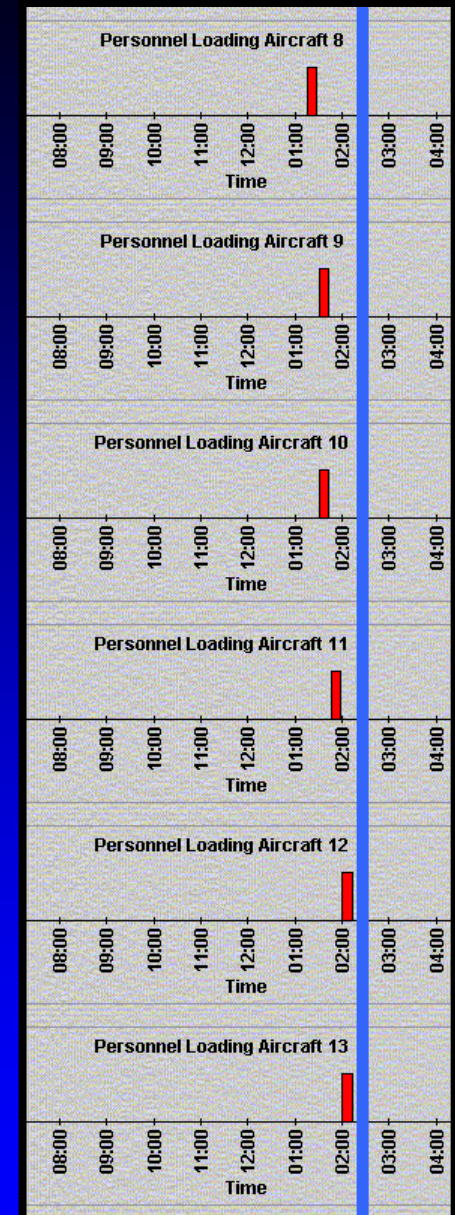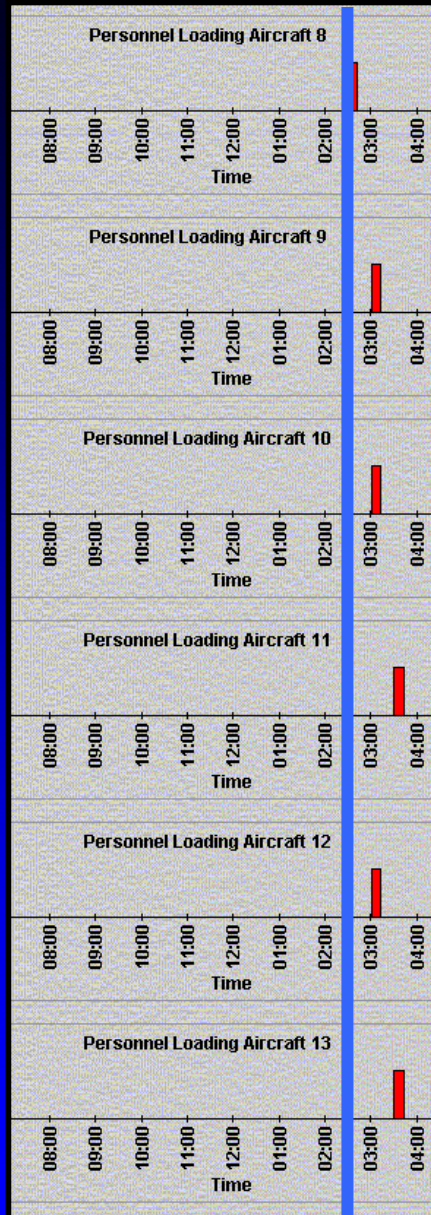
Can be used now…

- **Basic Capability Works (new technology)**
  - **Rapidly create new models and simulations**
  - **Uses existing data sets***
  - **Move processes around the installation**
  - **Can test proposed structures or processes**
 - **Five prototype installations exist**
  - **Stand alone capability**

* If data is of appropriate quality

FY 05 Deliverables

- Rule Based Simulation
  - Entity behavior
  - Role Changes
  - Resource allocation
- Deployment Manager
- Multiple Locations

These functionalities will allow modeling of End to End Deployments from multiple locations and mobilization of Reserve Component Units

Optimizing Resources

Determining resources required as a function of flow
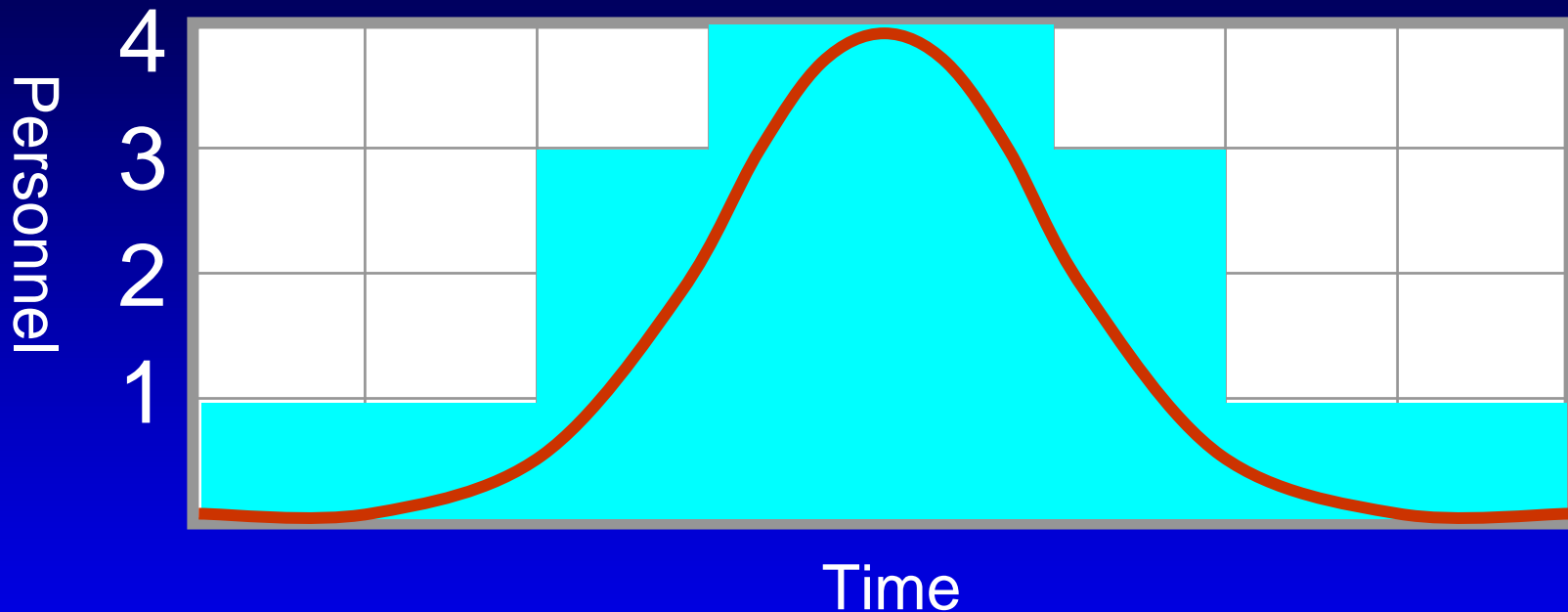
Flow of Soldiers ——————

32 man-hours versus 18 man-hours

US Army Corps
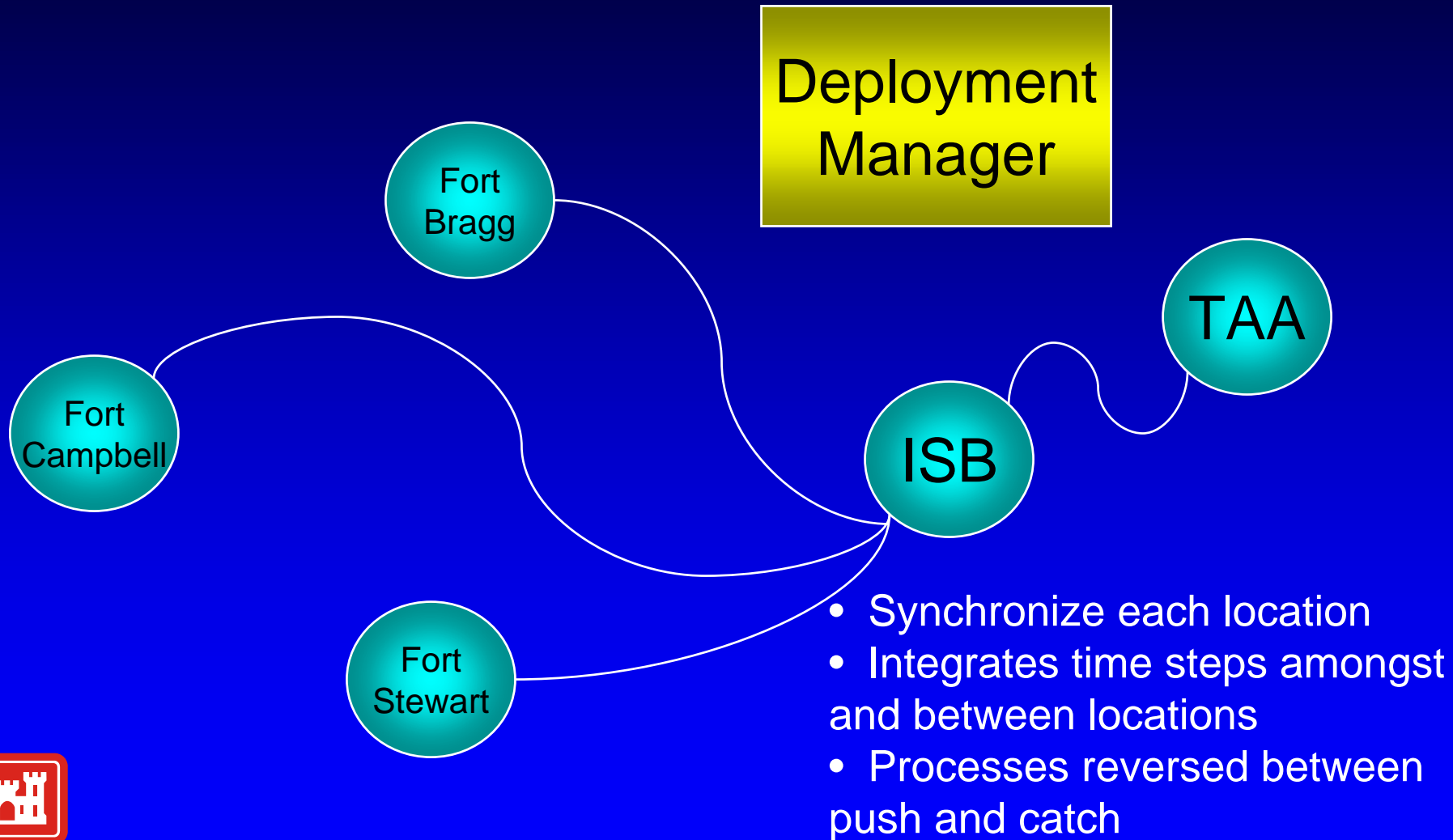of Engineers

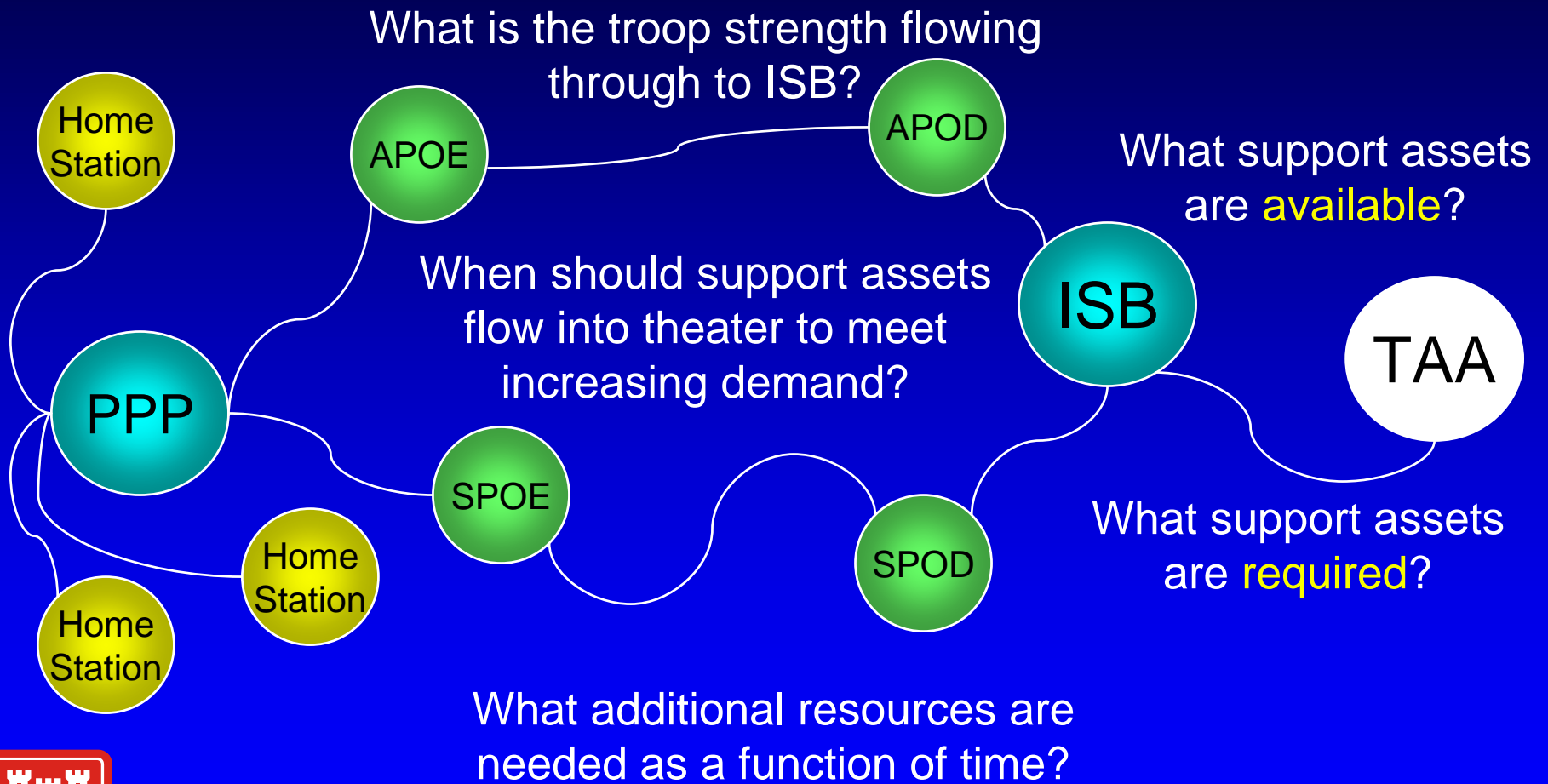Engineer Research and Development Center

Rule Types

- **Entity Rules: Based on entity roles and attributes**
- **Process Rules: Based on process ordering and timing**
- **Resource Rules: "The Bus"**
- **Deployment Manager Rules:**
  - **Resource allocation**
  - **Role changes**
  - **Decision Points**
  - **Multiple locations**

Multiple Units Deployed from Multiple Locations

Deployment Manager

Fort Bragg

TAA

Fort Campbell

ISB

Fort Stewart

- Synchronize each location
- Integrates time steps amongst and between locations
- Processes reversed between push and catch

The Problem "End to End"

What is the troop strength flowing through to ISB?

What support assets are available?

When should support assets flow into theater to meet increasing demand?

What support assets are required?

What additional resources are needed as a function of time?

Home Station

APOE

APOD

ISB

TAA

PPP

SPOE

Home Station

SPOD

Home Station

Foundation to Do More

- Extend from planning to execution

- Accept and Display Live Feeds

- Predictive Capability

  - Lock Live Feeds to set Baseline

  - Run Simulation to forecast results

Questions?